

DETAILED ACTION

Election/Restrictions

1. Newly submitted claim 12-13 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Invention I (claims 1 - 11) is drawn to dye-sensitized solar cell, wherein the Invention II (claims 12-13) is drawn to a method of manufacturing a dye-sensitized solar cell. The inventions I and II are distinct from each other because the dye-sensitized solar cell in invention I can be produced by different methods, such as deposition or attaching two substrates with each substrate having different layers deposited thereon.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 12-13 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1 and 9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 9 recite limitation "lamine unit" in line 3. A "lamine unit" is not clearly defined. The meets and bounds for a "lamine unit" cannot be determined. For example, it is unclear whether a "lamine unit" is made by lamination or covered by protective sheet(s). The Examiner will define the "lamine unit" by its structural limitations following the term "lamine unit".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 9 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Ono (US Application Publication 20030013008).

Regarding claim 9, as seen in Figure 13, Ono teaches an image sensor (or dye-sensitized solar cell – See paragraph 0220) comprising a first substrate (top 100) having a light-transmitting property; semiconductor electrode (220b) containing a sensitizing dye and arranged in such a manner that a first surface of the semiconductor electrode faces the first substrate (top 100) to leave a space therebetween; a first collector electrode (middle 210 adjacent to 200b) layer arranged on a second surface of the semiconductor electrode; a catalytic electrode layer (400) arranged in such a manner that a the first surface of the catalytic electrode layer faces the first collector electrode; an insulating layer (middle 100) arranged between the first collector electrode and the

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catalytic electrode layer and a second substrate (bottom 100) arranged on a second surface of the catalytic electrode layer; and an electrolyte material (300) incorporated in the semiconductor electrode, the first collector electrode and the insulating layer and filled in the space between the first substrate and the first surface of the semiconductor electrode.

Regarding claim 11, as seen in Figure 13, Ono teaches the collector electrode (middle 210 adjacent to 220b) having leaks 100a runs through it. Therefore it is the Examiner's position that the first collector electrode has a planar configuration in a grid pattern.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1 and 3-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekiguchi et al (JP2001-283941) in view of Kay (US Patent 6069313) or Ono (US Application Publication 20030013008). A machine translation is provided for reference JP2001-283941.

Regarding claims 1 and 6, as seen in Figures 1-6, Sekiguchi et al teaches a dye-sensitized solar cell comprising a first substrate (2) having a light transmitting property; a semiconductor electrode containing a sensitized dye (or coloring matter support semiconductor 3) and arranged in such a manner that a first surface of the semiconductor electrode comes in contact with the first substrate; a first collector electrode (4) arranged on a second surface of the semiconductor electrode; a catalytic electrode layer (9); a second substrate (7) arranged on a second surface of the catalytic electrode layer; a second collector electrode (8) between the second substrate (7) and the catalytic electrode (9). (See paragraphs 0029-0043)

The difference between Sekiguchi et al and the instant claims is that Sekiguchi et al does not specifically teach an insulating layer arranged in contact with the first electrode and facing the first surface of the catalytic layer.

Kay teaches a dye sensitized solar cell having an insulating layer (5) in contact with one electrode (6) and facing the other electrode (2). (See Figure 1 and col. 1 line 59 to col. 2 line 30).

Ono teaches an dye-sensitized solar cell having an insulating layer (middle 100 in Figures 12-14) arranged in contact with an electrode (210 in 200b as seen in Figures

12-13, or 200c in Figure 12) and facing the first surface of the catalytic layer (400). (See Figures 12-14 and paragraphs 159, 164-166, 220).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the solar cell of Sekiguchi et al by incorporating an insulating layer between the first collector electrode and catalytic electrode such that the insulating layer in contact with one electrode (or the first collector electrode) and facing the other electrode (i.e. the catalytic electrode) as taught by either Kay or Ono, because Kay teaches that the insulator formed between two electrodes of a solar cell would prevent short-circuiting in case of material of one electrode forming ohmic contact with the other electrode. (See col. 2 lines 1-12 of Kay). In addition, having insulator between two electrodes of opposite types would have been well within a skill of an artisan, because it would prevent short-circuiting as stated in the reference to Kay.

Regarding claim 3, Sekiguchi et al, Kay and Ono all teach the semiconductor electrode is prepared from titanium oxide. (See paragraphs 0033 and 0044 of Sekiguchi et al, col. 3 lines 15-16 of Kay, paragraph 0061, 0204 of Ono)

Regarding claim 4, as seen in Figures 1-6, Sekiguchi et al teaches the first collector electrode (4) is in form of the porous layer (or mesh layer) which can be dense as shown in Figures 1 and 4 or very porous as shown in Figure 3. Sekiguchi et al. also teaches the porosity of the mesh electrode is not limited as long as it can allow fluid to pass, and the number of mesh openings (or mesh eye) is preferably about 20-500 (See

paragraph 0037). Therefore it would have been obvious to one skill in the art that the porous collector electrode of Sekiguchi et al. can have a porosity of 2 to 40%.

Regarding claims 5 and 7, as seen in Figures 1-6, Sekiguchi et al teaches the first collector electrode (4) has a planar configuration in a grid pattern.

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sekiguchi et al. in view of Kay or Ono and further view of Nakamura (US Patent 6291763).

Sekiguchi et al in view of Kay or Ono teaches a dye-sensitized solar cell as described in claim 1.

Sekiguchi et al. in view of Kay or Ono does not teach the second substrate is made of ceramic.

Nakamura teaches using a ceramic substrate. (See col. 30 lines 23-28).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Sekiguchi et al in view of Kay or Ono by using ceramic substrate as taught by Nakamura, because it would provide a supporting substrate to build up photovoltaic cells. (See col. 30 lines 23-28 of Nakamura).

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sekiguchi et al in view of Kay or Ono as applied in claims 1 and 3-7, and further in view of Niwa et al. (US Patent 5324365)

Sekiguchi et al. in view of either Kay or Ono teaches a dye-sensitized solar cell as applied to claims 1 and 3-7.

Sekiguchi in view of either Kay or Ono does not teach a collector electrode containing tungsten.

Niwa et al. teaches an electrode containing tungsten (See col. 4 line 31).

It would have been obvious to one skilled in the art at the time the invention was made to modify the electrode of Sekiguchi et al in view of either Kay or Ono by using tungsten containing electrode as taught by Niwa et al, because Niwa et al teaches that a tungsten electrode would provide a conductive layer that is rigid, low in resistance to conductivity and less diffusion into the semiconductor layer. (See col. 10 lines 19-33 of Niwa et al)

7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ono (US Application Publication 20030013008)

Ono teaches a dye-sensitized solar cell as described in claim 9, wherein the first collector electrode (middle 210 adjacent 220b) is in the form of a porous layer. Ono does not specifically teach that the porosity of the porous layer is 2 to 40%. However, according to the diagrammatical presentation shown in Figure 13, the opening regions (or porosity) of the first collector electrode (middle 210 adjacent to 220b) is relatively smaller than the solid regions, and about 2-40%. Therefore, it would have been obvious

to an artisan that the porosity of Ono's first collector electrode (210 adjacent to 220b) is about 2 to 40%.

Response to Arguments

Applicant's arguments with respect to claims 1-7 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to THANH-TRUC TRINH whose telephone number is (571)272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edna Wong/

Primary Examiner, Art Unit 1795